flow-weighted mean fraction of dilution air in diluted exhaust, $\bar{x}_{dil}$. Multiply the total flow of dilution air by the mean concentration of a background emission. This may be a time-weighted mean or a flow-weighted mean (e.g., a proportionally sampled background). The product of $n_{dil}$ and the mean concentration of a background emission is the total amount of a background emission. If this is a molar quantity, convert it to a mass by multiplying it by its molar mass, $M$. The result is the mass of the background emission, $m$. In the case of PM, where the mean PM concentration is already in units of mass per mole of sample, $\bar{M}_{PM}$, multiply it by the total amount of dilution air, and the result is the total background mass of PM, $m_{PM}$. Subtract total background masses from total mass to correct for background emissions.

(b) You may determine the total flow of dilution air by a direct flow measurement. In this case, calculate the total mass of background as described in §1065.650(b), using the dilution air flow, $n_{dil}$. Subtract the background mass from the total mass. Use the result in brake-specific emission calculations.

(c) You may determine the total flow of dilution air from the total flow of diluted exhaust and a chemical balance of the fuel, intake air, and exhaust as described in §1065.655. In this case, calculate the total mass of background as described in §1065.650(b), using the total flow of diluted exhaust, $n_{dexh}$, then multiply this result by the flow-weighted mean fraction of dilution air in diluted exhaust, $\bar{x}_{dil}$. Calculate $\bar{x}_{dil}$ using flow-weighted mean concentrations of emissions in the chemical balance, as described in §1065.655. You may assume that your engine operates stoichiometrically, even if it is a lean-burn engine, such as a compression-ignition engine. Note that for lean-burn engines this assumption could result in an error in emission calculations. This error could occur because the chemical balances in §1065.655 correct excess air passing through a lean-burn engine as if it was dilution air. If an emission concentration expected at the standard is about 100 times its dilution air background concentration, this error is negligible. However, if an emission concentration expected at the standard is similar to its background concentration, this error could be significant. If this error might affect your ability to show that your engines comply with applicable standards, we recommend that you remove background emissions from dilution air by HEPA filtration, chemical adsorption, or catalytic scrubbing. You might also consider using a partial-flow dilution technique such as a bag mini-diluter, which uses purified air as the dilution air.

(d) The following is an example of using the flow-weighted mean fraction of dilution air in diluted exhaust, $\bar{x}_{dil}$, and the total mass of background emissions calculated using the total flow of diluted exhaust, $n_{dexh}$, as described in §1065.650(b):

$$m_{bkgnd} = \bar{x}_{dil} \cdot m_{bkgnddexh} \qquad \text{Eq. 1065.667-1}$$

$$m_{bkgnddexh} = M \cdot \bar{x}_{bkgnd} \cdot n_{dexh} \qquad \text{Eq. 1065.667-2}$$

*Example:*

$M_{NOx} = 46.0055$ g/mol

$\bar{x}_{bkgnd} = 0.05$ μmol/mol $= 0.05 \cdot 10^{-6}$ mol/mol

$n_{dexh} = 23280.5$ mol

$\bar{x}_{dil} = 0.843$

$m_{bkgndNOxdexh} = 46.0055 \cdot 0.05 \cdot 10^{-6} \cdot 23280.5$

$m_{bkgndNOxdexh} = 0.0536$ g

$m_{bkgndNOx} = 0.843 \cdot 0.0536$

$m_{bkgndNOx} = 0.0452$ g

## § 1065.670 NO$_X$ intake-air humidity and temperature corrections.

See the standard-setting part to determine if you may correct NO$_X$ emissions for the effects of intake-air humidity or temperature. Use the NO$_X$ intake-air humidity and temperature

corrections specified in the standard-setting part instead of the $NO_X$ intake-air humidity correction specified in this part 1065. If the standard-setting part allows correcting $NO_X$ emissions for intake-air humidity according to this part 1065, first apply any $NO_X$ cor-rections for background emissions and water removal from the exhaust sample, then correct $NO_X$ concentrations for intake-air humidity using one of the following approaches:

(a) Correct for intake-air humidity using the following equation:

$$x_{NOxcor} = x_{NOxuncor} \cdot (9.953 \cdot x_{H2O} + 0.832) \qquad \text{Eq. 1065.670-1}$$

*Example:*

$x_{NOxuncor}$ = 700.5 µmol/mol
$x_{H2O}$ = 0.022 mol/mol
$x_{NOxcor}$ = 700.5 · (9.953 · 0.022 + 0.832)
$x_{NOxcor}$ = 736.2 µmol/mol

(b) Develop your own correction, based on good engineering judgment.

### § 1065.672 Drift correction.

(a) *Scope and frequency.* Perform the calculations in this section to determine if gas analyzer drift invalidates the results of a test interval. If drift does not invalidate the results of a test interval, correct that test interval's gas analyzer responses for drift according to this section. Use the drift-corrected gas analyzer responses in all subsequent emission calculations. Note that the acceptable threshold for gas analyzer drift over a test interval is specified in § 1065.550 for both laboratory testing and field testing.

(b) *Correction principles.* The calculations in this section utilize a gas analyzer's responses to reference zero and span concentrations of analytical gases, as determined sometime before and after a test interval. The calcula-tions correct the gas analyzer's responses that were recorded during a test interval. The correction is based on an analyzer's mean responses to reference zero and span gases, and it is based on the reference concentrations of the zero and span gases themselves. Validate and correct for drift as follows:

(c) *Drift validation.* After applying all the other corrections—except drift correction—to all the gas analyzer signals, calculate brake-specific emissions according to § 1065.650. Then correct all gas analyzer signals for drift according to this section. Recalculate brake-specific emissions using all of the drift-corrected gas analyzer signals. Validate and report the brake-specific emission results before and after drift correction according to § 1065.550.

(d) *Drift correction.* Correct all gas analyzer signals as follows:

(1) Correct each recorded concentration, $x_i$, for continuous sampling or for batch sampling, $\bar{x}$.

(2) Correct for drift using the following equation:

$$x_{idrift\ corrected} = x_{refzero} + \frac{2 \cdot x_{refspan}}{x_{prespan} + x_{postspan}} \cdot \left( x_i - \frac{x_{prezero} + x_{postzero}}{2} \right) \qquad \text{Eq. 1065.672-1}$$

Where:

$x_{idriftcorrected}$ = concentration corrected for drift.
$x_{refzero}$ = reference concentration of the zero gas, which is usually zero unless known to be otherwise.
$x_{refspan}$ = reference concentration of the span gas.
$x_{prespan}$ = pre-test interval gas analyzer response to the span gas concentration.

$x_{postspan}$ = post-test interval gas analyzer response to the span gas concentration.
$x_i$ or $\bar{x}$ = concentration recorded during test, before drift correction.
$x_{prezero}$ = pre-test interval gas analyzer response to the zero gas concentration.
$x_{postzero}$ = post-test interval gas analyzer response to the zero gas concentration.

*Example:*

$x_{refzero}$ = 0 µmol/mol